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(तीसरा पुनरीक्षण)

Indian Standard

SAFETY MATCHES IN BOXES — SPECIFICATION

(Third Revision)

ICS 71.100.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 2004

Price Group 6

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

This standard was originally published in 1964 and subsequently revised in 1980. In the first revision, reference to IS 1140 : 1970 'Logs for matches (*second revision*)' was made recommendatory in view of the difficulties faced by the manufacturers of safety matches in the limited availability of specific timber of which splints are made of. For the guidance of manufactures of safety matches, a couple of typical formulae for preparing the head material from various chemicals were also prescribed.

In the second revision, requirement and the method of test for damp-proofness was modified and additional requirement of potassium chlorate content in the match head composition was included. Conformance of match splints to IS 9880 : 1981 'Wax coated paper splints' or IS 10374 : 1982 'Wooden splints for safety matches', were made mandatory. Methods of test for checking the bonding of the match head to the splint and the after-glow was also included in that revision. Packaging clause was suitably modified.

In this revision, clause pertaining to red phosphorus and potassium chlorate has been modified by making it informative only instead of mandatory compliance of raw material to relevant Indian Standard and requirement of potassium chlorate and tearing off match heads has been deleted. In case of potassium chlorate the test method described for determining the potassium chlorate content was not giving the correct results. The conformity of match splints to IS 10374 : 1982 has been modified since the majority of match industry is cottage and it is difficult to procure the wooden splints conforming to IS 10374 : 1982. More terms have been included in terminology. Requirement for striking performance and some more physical requirement have been included, method of test for ignition under impact has been modified. Requirement of packing has been made as *Weight and Measures Rule*. All the three amendments have been incorporated.

The composition of the Committee responsible for formulation of this standard is given in Annex H.

Considerable assistance has been derived from following international publications:

AS 3667 : 1989	Safety matches and boxes — Safety requirements (Australia)
EN 1783 : 1997	Matches, performance requirements, safety and classification (European Union)
SI 282 : 1975	Wood safety matches (Israel)

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SAFETY MATCHES IN BOXES — SPECIFICATION

(Third Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for safety matches in boxes, both hand-made and machine-made.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of the standard the following definitions shall apply:

3.1 Match Stick — Match stem tipped in combustible material that provides support during ignition and the fuel for its continued burning.

3.2 Striking Surface — Surface against which matches are struck to light them.

3.3 Match Boxes — Unit for retaining the matches and incorporating the means for igniting these in the form of a striking surface.

NOTE — Matches are available in boxes the most typical of which are boxes.

3.4 Safety Match — Match that can be ignited only by being struck against a complimentary composition to that of the head coated on part of the match box.

3.5 Wood Match — Match with a stem made from wood.

3.6 Wax Match — Match with a stem constructed from paper and impregnated with wax.

3.7 Doubles — The match heads joined together by a bridge of composition, which is regarded as one match for the purpose of this standard.

3.8 Fractured Heads — Match heads with broken or cracked surfaces.

3.9 Fractured Stems — Match stems that break with no separation.

3.10 After Glow — Residual glow after the flame has been extinguished.

3.11 Head Composition — Combustible material conforming to match tip.

3.12 Normal Corrected Vision — The naked eye corrected to normal vision if necessary.

NOTE — This is usually done by wearing spectacles or lenses.

3.13 Splint — A short and thin stick made out of wax-coated paper or wood, used in the manufacture of matchsticks.

3.14 Spurting — The safety matches when struck on the friction surface, the match head either burns violently, scattering hot particles or explodes or the flame shoots up in a particular direction.

3.15 Carborized Materials — Carborization is the process of treating match sticks in special chemical to put off the glow and to prevent the falling of burnt particle on the earth after the sticks chemical head burn.

4 MATERIALS

4.1 Potassium chlorate (*see* Grade 2 of IS 708) red phosphorus (*see* IS 2012).

4.2 Other important ingredients and materials used in match manufacture are animal glue (*see* IS 852), antimony sulphide (*see* IS 5731), iron oxide (*see* IS 44), lamp black (*see* IS 40), manganese dioxide (*see* IS 5713), match paper (*see* IS 3303), paraffin wax (*see* IS 4654), potassium bichromate (*see* IS 250), wood for matches (*see* IS 1140), zinc oxide (*see* IS 35) glass powder and sulphur.

5 VISUAL INSPECTION

5.1 Complete Product

5.1.1 *Contents*

The number of matches in a match box shall be as agreed to between seller and the purchaser subject to the requirement of *Standard of Weights and Measures (Packaged Commodities) Rules*, 1977. While counting the doubles shall be counted as one match stick.

5.1.2 *Match Boxes*

5.1.2.1 The inner tray and the outer cover shall be made of wood, cardboard or suitable plastic material. The material of which inner tray is made may be the same or different from that of the outer cover/ box.

5.1.2.2 The empty match box shall be capable of bearing, without damage, a minimum vertical load of 100 N (10 kgf approximately) exerted gradually on its broad side when it is laid flat on a hard horizontal surface.

NOTE — In case of dispute, the match box shall be conditioned at a temperature of 27 ± 2°C and relative humidity of 65 ± 5 percent for 1h before carrying out the test.

5.1.3 *Envelopment*

All matches shall be inside matchbox.

5.1.4 *Ease of Opening*

When each matchbox is opened and closed once, it shall not tear or acquire any additional creases or getting de-shaped resulting from excessive force having to be applied.

5.1.5 *Retention of Contents*

After the operation in **5.1.4** the contents shall be retained when the closed box is opened in all direction.

5.1.6 *Defective Match Boxes*

5.1.6.1 *Broken and crushed boxes*

The broken and crushed boxes in the test sample shall not exceed 5 percent.

5.1.6.2 All the boxes in the sample shall be properly fitted when tested as given below:

> Remove the band roll from the box and hold it vertically, watch whether the inner tray falls out of the box by itself count the boxes in which the inner tray have fallen due to their loose fittings.

5.2 Individual Matches

5.2.1 *Match Splints*

5.2.1.1 The match splints shall be of consistent dimensions, to within ± 15 percent of the mean values and shall be not less than 32 mm (in case of wooden splints) and 26 mm (in case of wax coated paper splints) in length, including the head.

5.2.1.2 The wooden splints used for making sticks shall be smooth, without bristles and shall be dipped in paraffin wax to such a length so that atleast two-third's of its length shall burn smoothly when held horizontally in a draught free atmosphere. The minimum thickness measured at centre (on both peeling and chopping side separately) shall be 1.8 mm with an average of not less than 2.0 mm for a sample of 50 match sticks when measured using vernier calipers or dial calipers and no undue pressure shall be applied during the measurement. For wax -coated paper splints *see* IS 9880.

5.2.2 *Unserviceable Sticks*

The total unserviceable sticks shall not exceed 5 percent of the number of match sticks taken for the test. The sticks which are considered as unserviceable are classified below.

5.2.2.1 *Badly-distorted heads*

Heads shall be considered distorted when they show pronounced abnormalities in shape or surface, especially heads which carry sharply defined peaks.

5.2.2.2 *Fractured heads*

Heads shall be considered fractured when their surface has been broken or cracked.

5.2.2.3 *Doubles*

Two heads linked together by a bridge of composition shall be termed as doubles. The doubles shall be counted as one.

5.2.2.4 *Broken/bent matchsticks*

A matchstick is considered to be broken, if length is less than 32 mm for wooden splints and bent. If the length is less than 26 mm for wax coated paper splints.

The broken/bent matchsticks in the test sample shall not exceed 5 percent.

5.3 Match Boxes

The boxes shall incorporate the defined area of uniformly distributed striking surface. The product making up the striking surface shall never be present on the inside of the box in a position where contact with the match heads could be possible during normal access to the contents.

6 PERFORMANCE REQUIREMENTS

6.1 Striking Performance

6.1.1 *General*

When tested as described in **B-1** to **B-8**, all matches shall ignite instantly and shall exhibit no breakage or fracture prior to, or following, ignition. During ignition there will be no breakage, detachment explosion or fragmentation of the heads or dropping of hot ash. Following ignition, the flame shall transfer from the head to the stem. After ignition the stem shall not have fractured or broken with detachment of the ignited part. When burning continues with the stem head horizontally liquid shall not drip from the match. When allowed to burn for half the stem length or for at least 10 s whichever across first and then excessive with a blast of area a match shall not continue to glow for more than 4 s (for carborized sticks only) unless it is a wax match in which case it shall not continue to glow for more than 8 s.

6.1.2 *Safety Matches*

When tested as described in **B-9**. It shall not be possible to ignite the matches by striking on a flint paper of IS grit number 120(3/0) [*see* IS 715 (Part 1)], the average length of stroke on the flint paper shall be about 50 mm.

6.2 Ignition Below 170°C

When tested as described in Annex C match boxes of safety matches shall not ignite spontaneously.

6.3 Ignition Under Impact

When match sticks are struck with a hammer of 170 g and tested as per Annex D, there should not be ignition of any match stick.

6.4 Performance of the Striking Surface

6.4.1 *Durability of the Striking Surface*

When tested as described in **E-2** the striking surface of a match box shall be capable of igniting all of its contents on not more than half available surface.

6.4.2 *Ignition of the Striking Surface*

When tested as described in **E-3** the striking surface shall not ignite or use burn fragments.

6.4.3 *Loss of Burning Fragments*

When tested in accordance with **E-4** there shall be no loss of burning fragments.

6.5 Damp Proofness for Match Boxes

The minimum damp proofness shall be minimum 60 percent when tested according to Annex F.

7 PACKING

Packing of match boxes shall be as per *Weight and Measures Rules.*

8 MARKING

The match box, the packet and the carton shall have a label affixed to each one of them indicating the following details:

- a) *Match Box*
  - 1) Indication of the source of manufacture, and
  - 2) The number of match sticks.
- b) *Packet*
  - 1) Indication of the source of manufacture,
  - 2) Month and year of production,
  - 3) Number of match boxes, and
  - 4) Number of match sticks in each box.
- c) *Carton or Bundle*
  - 1) Indication of the source of manufacture,
  - 2) Month and year of production, and
  - 3) Number of match boxes in a carton.

9 SAMPLING

Representative samples of the material shall be drawn and their conformity determined in accordance with the method prescribed in Annex G.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
35 : 1975	Zinc oxide for paints (*first revision*)
40 : 1971	Carbon black for paints (*first revision*)
44 : 1991	Iron oxide pigments for paints — Specification (*second revision*)
196 : 1966	Atmospheric conditions for testing (*revised*)
250 : 1964	Potassium bichromate, technical and analytical reagent (*revised*)
708 : 1987	Potassium chlorate for explosive and pyrotechnic industry (*second revision*)
715 (Part 1) : 1976	Specification for coated abrasive : Part 1 General applications (*third revision)*
852 : 1994	Specification for animal glue for general wood-working purposes (*second revision*)
1140 : 1988	Specification for logs for matches (*second revision)*
1398 : 1982	Packing paper, water-proof, bitumen laminated (*second revision*)
2012 : 1961	Specification for red phosphorus
2480 (Part 1) : 1983	General purposes glass thermometers : Part 1 Solid stem thermometers (*second revision*)
3303 : 1986	Match paper (*first revision*)
4654 : 1993	Paraffin wax — Specification (*second revision*)
5713 : 1981	Manganese dioxide for explosive and pyrotechnic compositions (*first revision*)
5731 : 1970	Antimony sulphide for explosive and pyrotechnic compositions
6128 : 1971	Desiccators
9880 : 1981	Wax coated paper splints

ANNEX B

(*Clause* 6.1.1)

METHOD OF TEST FOR STRIKING PERFORMANCE

B-1 Ensure that this test is in a draught-free environment and that matches are not moved once ignition has been initiated.

B-2 With the match box held over an A4 sheet of white paper of grammage 80 + 5 g/m^2, hold the match firmly between the first finger and thumb, as shown in Fig. 1, and strike it against the striking surface of the box with the minimum pressure necessary to cause ignition. The match should be held approximately 100 mm above the sheet of paper during testing.

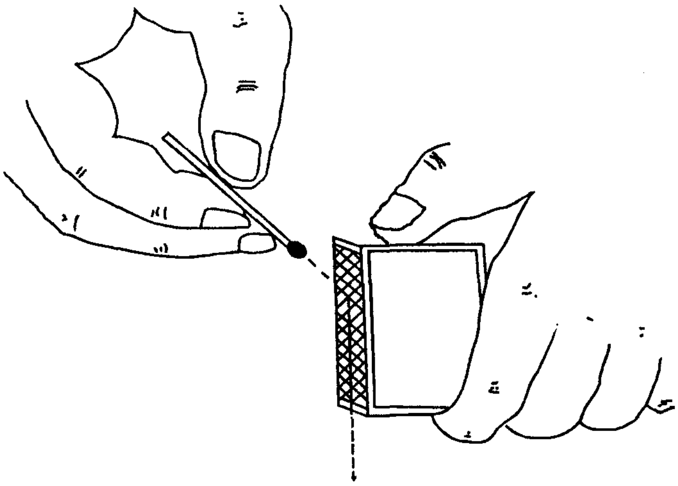

FIG. 1 MODE OF STRIKING

B-3 Record any breakage or fracture of the stem prior to ignition and whether ignition occurs or is delayed.

B-4 At ignition, record any explosion or fragmentation of the match head or any breakage of the stem which results in separation of the broken pieces.

B-5 During ignition, record any dropping of hot ash sufficient to permanently mark the paper with burn marks.

B-6 Following ignition, record any breakage or fracture of the stem or detachment of the burning head and whether. the flame transfers successfully from the head to the stem.

B-7 Allow the match to continue to burn with the stem horizontal until the flame has spread halfway along the stem. Record whether liquid drips from the stem during burning (*see* note under **B-8**).

B-8 When the flame reaches half-way along the stem, or after burning for at least 10 s, extinguish it with a puff of air and record whether the charred stem continues to glow for more than 4 s or, for cardboard and wax matches, for more than 6 s (*see* Note).

NOTE — If the match extinguishes before the flame reaches half way along the stem, record events at and after the moment of extinguishing.

B-9 Strike the matches on a supported flint sheet of IS Grit 120(3/0) and record whether ignition can be initiated.

ANNEX C

(*Clause* 6.2)

IGNITION BELOW 170°C

C-1 PRINCIPLE

The test is carried out by placing the match sticks in an oven maintained at 170°C and examined for ignition.

C-2 APPARATUS

C-2.1 Oven

Oven to be used shall be air circulated thermo-statically controlled electric oven of which electrical elements shall be totally enclosed.

C-2.2 Thermometer

To read up to 200°C with a divisional accuracy of 1°C [*see* IS 2480 (Part 1)].

C-2.3 Wooden Block

It shall be 30 mm thick and 50 mm square, having a hole of 10 mm diameter to a depth of 25 mm at the centre to serve as a receptacle to hold the sticks.

C-3 PROCEDURE

Take 10 normal match sticks ready for use from the selected match boxes of the test sample and place them with the heads up in the receptacle of the wooden block. Place the block in the centre of the oven. Suspend the thermometer in such a way that its bulb is in the level with the match heads and is at a distance of about 50 mm from the match heads. Thermometer bulb shall be covered with a wire mesh. Close the door of the oven and raise its temperature to 140°C. After this, raise the temperature uniformly at a rate of approximately 3° per minute until 170°C temperature is reached.

C-4 TEST RESULT

The sample shall be taken to have passed the test, if none of the match sticks catches fire.

ANNEX D

(*Clause* 6.3)

METHOD OF TEST FOR IGNITION UNDER IMPACT

D-1 PRINCIPLE

The test is carried out by striking the match sticks with a hammer of 170g and examined for ignition.

D-2 APPARATUS

The apparatus shall be assembled as shown in Fig. 2.

D-3 PROCEDURE

Take 10 match sticks from the selected match boxes of the test sample and test each match stick separately. Place the stick on the anvil of polished steel, in such a way that the stick is horizontal and the head is its centre. Drop the striking hammer by releasing the spring catch. Observe whether the head catches fire under this impact.

D-4 TEST RESULT

The sample shall be taken to have passed the test, if none of the match sticks catches fire.

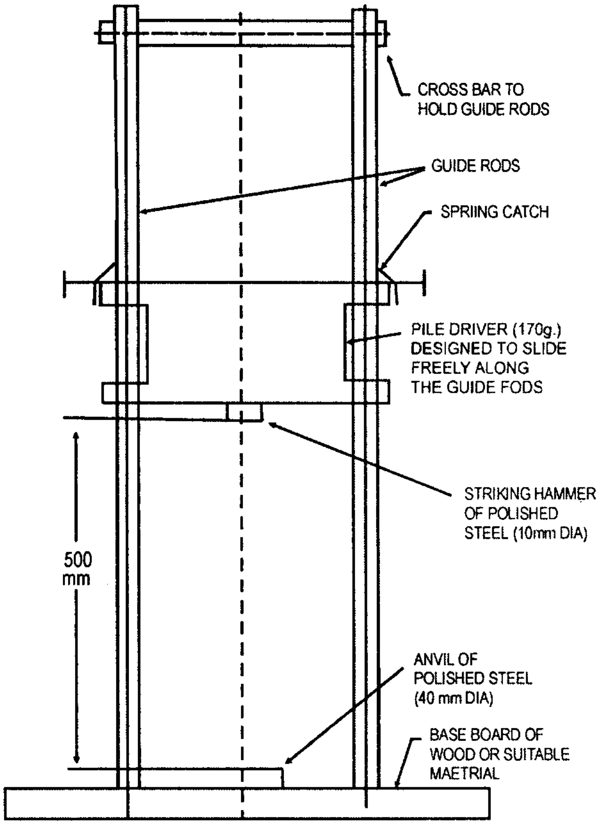
CROSS BAR TO HOLD GUIDE RODS
GUIDE RODS
SPRIING CATCH
PILE DRIVER (170g.) DESIGNED TO SLIDE FREELY ALONG THE GUIDE FODS
STRIKING HAMMER OF POLISHED STEEL (10mm DIA)
500 mm
ANVIL OF POLISHED STEEL (40 mm DIA)
BASE BOARD OF WOOD OR SUITABLE MAETRIAL

FIG. 2 APPARATUS FOR IMPACT TEST

ANNEX E

(*Clauses* 6.4.1 *and* 6.4.2)

METHODS OF TEST FOR PERFORMANCE OF THE STRIKING SURFACE

E-1 DAMP REMOVAL

Apply a single drop of water to the striking surface. After 20 s carefully wipe the surface with a soft dry tissue and record if any removal of the striking surface exposes the underlying surface of the box.

E-2 DURABILITY AND IGNITION

E-2.1 For match boxes of average contents up to and including 50 matches, strike the entire contents of the match box, using the method described in **A-1** on an area of striking surface restricted to 50 + 5 per cent of that provided on the box.

NOTE — The area of striking surface may be controlled, for example by using one side only of a match box with striking surface on both sides or by masking of a section of the available surface with cellulose tape.

E-2.2 For boxes of average contents exceeding 50 matches strike not less than 10 percent of the contents or 50 matches, whichever is the greater, using the method described in **A-1**, on that percentage of the striking surface provided determined by:

$$\frac{\text{No. of matches struck} \times 50}{\text{Total contents}}$$

Round fractional numbers to the nearest whole number.

E-3 IGNITION OF THE FRICTION SURFACE

Strike one match on each match box (*see* **B-2**) and record any continued burning of the friction surface after the match has ignited.

E-4 LOSS OF BURNING FRAGMENTS

Strike one match on each match box (*see* **B-2**) and record any loss of burning fragments from the friction surface.

ANNEX F

(*Clause* 6.5)

METHOD OF TEST FOR DAMP PROOFNESS

F-1 PRINCIPLE

The test is carried out by keeping the match boxes in a desiccator containing water for 24 h and examining for their burning quality.

F-2 APPARATUS

F-2.1 Desiccator — Inside diameter of about 250 mm and overall height 303 mm, with a plate inside (*see* IS 6128). The desiccator shall contain porcelain plate having 5 mm thickness or aluminium plate having 2 mm thickness consisting of 162 holes each of 5 mm diameter and a central hole of 2.3 mm diameter.

F-3 SAMPLE

Make 5 boxes each containing 50 serviceable sticks.

F-4 PROCEDURE

F-4.1 The test shall be carried out at a temperature of 27 ± 2°C. The match sticks shall be conditioned at 27 ± 2°C temperature and 65 ± 5 percent relative humidity for 6 h (*see* Note). Sufficient amount of water shall be taken in the desiccator, so that the distance between the water surface and the bottom surface of porcelain plate is about 25 mm. Five match boxes shall be placed in the desiccator in a way that the head side of each match box is half open and each box is resting on its edge with the friction surface vertical as well as heads up. This filling of desiccator with match boxes shall take not more than 2 min, when it is again placed in the ambient conditions mentioned above. The match boxes shall be placed on the desiccator plate so that each match box is not closer than 15 mm to the walls of the dessiccator. The desiccator shall remain closed for 24 h in the same ambient conditions (*see* Fig. 3)

NOTE — For extra-damp areas, the relative humidity may be 85 percent.

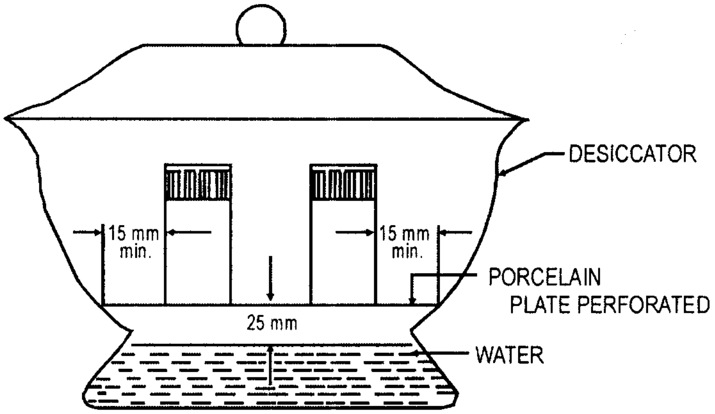

FIG. 3 CONDITIONING OF MATCHES IN DESICCATOR

F-4.2 One match box at a time shall be taken out from desiccator and immediately each of its sticks, one by one, shall be struck against the friction surface for igniting. This shall be repeated with other boxes in desiccator. The desiccator shall be closed after taking out each match box and this testing shall take not more than 15 min in all. The number of match sticks which blink, fizz, do not ignite or whose head fly off, shall be recorded as failure.

F-5 CALCULATION

Percent of damp-proofness shall be calculated as follows:

$$\text{Damp-proofness, percent} = \frac{(N - n) \times 100}{N}$$

where

N = total number of match sticks, taken for the test; and
n = total number of match sticks which blink, fizz, do not ignite or whose heads, fly off.

ANNEX G

(*Clause* 9)

METHOD OF SAMPLING FOR SAFETY MATCH BOXES

G-1 LOT

All the material of the same brand in a single consignment produced in the same manufacturing unit shall constitute a lot.

G-1.1 Samples shall be tested from each lot for ascertaining the conformity of the lot to the requirements of this standard. The number of cartons to be selected from a lot shall depend upon the size of the lot and shall be in accordance with Table 1.

Table 1 Number of Cartons to be Selected from a Lot

(*Clause* G-1.1)

Sl No.	Lot Size (Cartons) N	No. of Cartons to be Selected n
(1)	(2)	(3)
i)	3 to 25	3
ii)	26 to 50	4
iii)	51 to 100	5
iv)	101 to 150	6
v)	151 and above	7

G-1.2 These cartons shall be selected at random from the lot and for this purpose, random number tables shall be used. In case such tables are not available, the procedure given below shall be adopted.

G-1.2.1 Starting from any carton in the lot, count them as 1, 2, 3 etc, up to r and so on in one order. Every rth carton thus counted shall be withdrawn, where r is the integral part of N/n (N being the lot size and n the number of cartons to be selected).

G-1.3 From each of cartons selected in **G-1.1** select at random a certain number of preliminary packets depending upon the size of the carton, in accordance with Table 2.

Table 2 Number of Preliminary Packets to be Selected from a Carton

(*Clause* G-1.3)

Sl No.	No. of Intermediate Packets in the Carton	No. of Preliminary Packets to be Selected
(1)	(2)	(3)
i)	10	3
ii)	50	4
iii)	100	5

G-1.3.1 The packets from the cartons shall also be selected at random and to ensure the randomness of selection, random number tables or the procedure given in **G-1.2.1** shall be used.

G-1.3.2 *Test Sample*

Open each of the ten's packets in **G-1.3** and take out at random 4 match boxes from each of packets. The boxes thus selected from the packets shall constitute a test sample. These boxes shall then be divided at random into two sets of equal number of boxes. One set shall be for referee sample. The referee sample shall bear the seals of both the purchaser and the supplier and shall be kept at a place agreed to between the two. The referee sample shall be tested in case of dispute only.

G-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

G-2.1 All the match boxes in a test sample shall be examined for the requirements given in **5**.

G-2.1.1 The lot shall be considered as satisfactory in respect of these requirements, if the test sample of match boxes satisfies each one of these requirements.

G-2.2 From the match boxes in the test sample, select four boxes at random. Pool the match sticks from all the four boxes together and taking the requisite number of match sticks at random from this pool of match sticks, carry out the tests as prescribed in Annex B to Annex D.

G-2.2.1 The lot shall be considered satisfactory, if all the selected match sticks passes the test as given in **6.1** to **6.3**.

G-2.3 From the remaining match boxes of the test sample, select at random five boxes. Test each of the boxes for wearing strength of the striking surface according to Annex E .

G-2.3.1 The lot shall be considered satisfactory, if each of the five match boxes passes the test as given in **6.4**.

G-2.4 From the remaining match boxes of the test sample, select at random five match boxes and carry out the test for damp-proofness as given in Annex F.

G-2.4.1 The lot shall be considered as satisfactory in regard to this requirement, if the test result satisfies the requirement given in **6.5**.

G-2.5 From the remaining match boxes of test sample, select at random four boxes. Pool the matchsticks of these four boxes together. The lot shall be considered as satisfactory, if the total number of unserviceable matchsticks does not exceed 5 percent.

G-3 CRITERIA FOR CONFORMITY

The lot shall be declared as conforming to the requirements of this standard, if the different test results as obtained in **G-2** meet the corresponding requirements given in the standard.

ANNEX H

(Foreword)

COMMITTEE COMPOSITION

Explosives and Pyrotechnic Sectional Committee, CHD 26

Organization	*Representative(s)*
Chief Controller of Explosives, Nagpur	Shri R. H. Bhalekar ***(Chairman)*** Shri K. N. Ghosh (*Alternate*)
Central Mining Research Institute, Dhanbad	Dr M. M. Bhattacharya Shri R. R. Singh (*Alternate*)
Central Mine Planning & Design Institute Limited, Ranchi	Representative
Coal India Limited, Kolkata	Shri C. P. Bansal Shri D. K. Jain (*Alternate*)
Consumer Guidance Society of India, Mumbai	Shri N. G. Wagle Shrimati Renu Talwani (*Alternate*)
Development Commissioner (Small Scale Industries), New Delhi	Shri N. K. Guha Shri Y. S. Bhatnagar (*Alternate*)
Directorate General of Mines Safety, Dhanbad	Director (MSE) Deputy Director (*Alternate*)
Defence Research & Development Organization (DRDO), CEES, Ministry of Defence, Delhi	Representative
Directorate General Ordnance Factories (DGOF), Ministry of Defence, Kolkata	Shri C. Mridha Shri P. Velunayil (*Alternate*)
Directorate General of Quality Assurance (DGQA), Ministry of Defence, New Delhi.	Shri R. P. Khanna Dr A. K. Sarangi (*Alternate*)
Directorate of Standardization (DSTD), Ministry of Defence, New Delhi	Lt Col S. K. Lohani Shri S.B. Mehru (*Alternate*)

(Continued on page 10)

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Organization	*Representative(s)*
Federation of Corrugated Box Manufacturers of India, Mumbai	Shri Deepak Killawala Capt N. K. Dawar (*Alternate*)
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This Indian Standard has been developed from Doc : No. CHD 26 (998).

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Printed at Prabhat Offset Press, New Delhi-2